EXHIBIT
A

SUPPLEMENTAL AFFIDAVIT OF JOANN M. BURKHOLDER, Ph.D.

BEFORE ME, the undersigned authority, personally came and appeared, JoAnn Burkholder, Ph.D., who, after being duly sworn, did depose and say:

Qualifications

1) My name is JoAnn M. Burkholder. I am an expert in water pollution assessment and water quality monitoring of freshwaters and estuaries.

2) I am a professor of aquatic science and an environmental consultant, and am working on behalf of the commenting parties in this matter. An accurate copy of my curriculum vitae was attached to my previous affidavit.

Summary of Opinions

This supplemental affidavit supports the major findings of my previous affidavit:

- The approach used by the Louisiana Department of Environmental Quality (LDEQ) to set the minimum dissolved oxygen (DO) criterion of 2.3 mg/L during the critical period each year for the eastern LMRAP ecoregion failed to meet the minimum data requirements set in the U.S. EPA/LDEQ (2008) MOA for Establishment of Ecoregion-Based Dissolved Oxygen Criteria. Minimum sampling requirements of the MOA were not followed for all streams used in the BTUAA, and the criterion produced from that analysis was applied to the eastern LMRAP Ecoregion. In addition, continuous monitors were deployed for only 24 hours at some sites (LDEQ 2013, p.10, last sentence), rather than for 72 hours as stipulated in the MOA.

- The non-science-based "rationale" given for LDEQ (2014a) to revise the minimum DO criterion for streams in the eastern LMRAP ecoregion was that DO in streams there is 'naturally low' so that the nationally recommended minimum DO criterion of 5.0 mg/L (also see the Louisiana Administrative Code, Title 33, Part IX, Chapter 11, Surface Water Quality Standards) is not attainable during the critical period of each year. However,

  (i) LDEQ's selected "reference site" #3079 (LDEQ 2013, p.9) in the BTUAA did not conform with the agency's (LDEQ 2008b, p.13) own definition of reference sites as having no significant point or nonpoint sources discharging into or impacting the water body, such as urban developments. LDEQ's map showed that site #3079 was just downstream from an urban area (LDEQ 2013, p.9).

  (ii) In all of the reports cited in my first affidavit, LDEQ did not show <u>any</u> of the data upon which the agency's assertion was based. Its assertion was not supported by any

data in the reports, making it impossible to assess whether the sparse statistical information given (means, standard deviations etc.) was valid.

(iii) The "reference" waterbody sampling sites selected by LDEQ did not include any sites in the Northshore area; thus, LDEQ's analysis did not include any representative data for water quality in that area. Therefore, LDEQ has no scientific basis to assert any quantitative information about the Northshore waterbodies; it has no evidence that a "reference" condition for these waters is 2.3 mg DO/L. At least six Northshore sites (represented by 040807, 040808, 040903, 040914, 040912, and 040913) are Natural and Scenic waters of Louisiana. At a minimum, two of these sites should have been included as "reference sites." The LDEQ analysis cannot be assessed as scientifically valid until such sites are included among the "reference sites" and the analysis is redone accordingly.

(iv) Available monitoring data from LDEQ indicate that waters in the northern area of the eastern LMRAP, represented by subsegment 040506 (station 116), have met the 5.0 mg DO/L criterion in 238 of 242 measurements, that is, 98.4% of the time over the past several decades.

- LDEQ used the 10^{th} percentile of data from its "reference" streams (based on continuous monitoring data taken from 6 am to noon) to inappropriately bias in favor of much lower DO as "acceptable" in developing its 2.3 mg DO/L draft criterion. The 10^{th} percentile allows much lower DO than would be allowed if the U.S. EPA (2000a) recommendation to use the 75^{th} percentile of reference stream data was used.

- For much of the critical period (most of the year), 6 am to noon includes the time of day known to have the *lowest* DO over a diel (24-hour) duration, that is, the 6am to noon interval would have included the pre-dawn "oxygen sag." Thus, LDEQ focused on the time of day with the **worst** DO in order to assert, falsely, that 2.3 mg DO/L is the "naturally low" condition of western and eastern LMRAP waters. This 2.3 mg/L criterion would be inappropriately applies to all of these waters throughout the critical period. Routine monitoring is based *not* on continuous data but, rather, on *discrete measurements taken in mid- to late morning*. Because the 2.3 mg/L draft criterion reflects the pre-dawn oxygen sag, the draft criterion is much lower than it should be to assess whether conditions are adequate for beneficial aquatic life during mid- to late morning.

- The net result of the above-described analysis by LDEQ in developing its 2.3 mg DO/L draft criterion is that the draft criterion is well below what the U.S. EPA has defined as hypoxic, which is 3 mg/L (see http://omp.gso.uri.edu/ompweb/doee/science/physical/choxy1.htm). In its publication,

"Hypoxia 101," the U.S. EPA, "Hypoxic waters have dissolved oxygen concentrations of less than 2-3 ppm [mg/L]" (https://www.epa.gov/ms-htf/hypoxia-101). LDEQ's draft criterion is less than the mean (2.5mg/L) in that definition. Logistic models have predicted that first fish mortalities can begin at DO concentrations ranging from 2.4 mg/L to 3.1 mg/L for some juvenile fish species in lowland blackwater rivers (Small et al. 2014, *PLoS ONE* 9: e94524. Doi:10.1371/journal.pone.0094524).

- LDEQ's 2.3 mg/L draft criterion for the east LMRAP is based on inadequate analysis of acute and chronic DO levels for sensitive beneficial aquatic life, based on U.S. EPA guidelines (Stephan et al. 1985).

- LDEQ's 2.3 mg/L draft criterion would provide no margin of safety for sensitive life history stages of fish species in streams of the area; instead, this criterion would stress or kill sensitive life history stages of all but the most tolerant species. Based on an investigation of fish assemblages at 35 sites in lowland streams of southwestern Louisiana, a DO minimum of 2.5 mg/L was needed to maintain all but the most low-oxygen-tolerant species (Justus et al. 2012).

- The 2.3 mg DO/L draft criterion was based on inadequate "reference" data for a small number of freshwater segments, and should not be extended to apply to all estuarine segments in the LMRAP. LDEQ's assertion that "estuarine ecology of an area is fundamentally incorporated into the ecoregion delineations" is not science-based, and does not conform with U.S. EPA's (2000a) having recognized four different types of waters: freshwater lakes and reservoirs, freshwater rivers and streams, estuaries and coastal waters, and wetlands; or with U.S. EPA's having developed eutrophication criteria using different procedures for freshwaters versus estuaries.

JoAnn M. Burkholder

JoAnn M. Burkholder, Ph.D.

Acknowledgement

STATE OF NORTH CAROLINA

COUNTY OF Wake

I certify that Joann M. Burkhold, Sr personally appeared before me this day, acknowledging to me that he or she signed the foregoing document: Supplemental Affidavit.
Name or description of attached document

I further certify that:

☐ I have personal knowledge of the identity of the principal(s)

☑ I have seen satisfactory evidence of the principal's identity, by a current state or federal identification with the principal's photograph in the form of a NCDL.
type of identification

☐ A credible witness, _____, has sworn or affirmed to me the
name of credible witness
identity of the principal, and that he or she is not a named party to the foregoing document, and has no interest in the transaction.

Date: 3/8/16

Notary Public

Todd Bennett

Typed or Printed Notary Name

My commission expires: 12/9/17

(Official Seal)

TODD BENNETT NOTARY PUBLIC WAKE COUNTY, NC